Community Knowledge, Attitude, and Practice towards Importance and Sustainability of Mangrove Forests: A Case Study of Kuala Langat, Malaysia.

Rosazlin Abdullah^{1*}, Anis Farhana Hanif¹, Sahrianisa Toufik¹, Rozainah Mohd. Zakaria¹, Wan Rasidah Kadir.², Tariq Mubarak Husin², Nur Sa'adah Halim¹ and Aaronn Avit Ajeng¹

¹*Institute of Biological Science, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia*

²*Forest Research Institute Malaysia, 52109 Kepong, Selangor, Malaysia*

**Corresponding author*

Abstract - Mangrove forests degradation is happening globally at an alarming rate since the 80's. Land conversion for human activities is one of many reasons contributing to the issue. The access the Knowledge, Attitude and Practice (KAP) on the function and conservation of mangrove, data was collected in Kuala Langat, Selangor within the vicinity of Sijangkang Mangrove Recreational Park using in-depth interviews (N = 100) and analysed using ANOVA and linear regression. Results revealed that the respondents understand the importance of mangrove forests with high total mean knowledge score (80.93 ± 7.77), attitude (75.83 ± 8.51), and average on practice (55.95 ± 11.44). Education is an important indication; resident status will determine the attitude towards the knowledge on the mangrove conservation. The linear regression depicts positive correlation between KAP variables where any changes will affect other variables.

Keywords: Mangrove forest, Knowledge, Attitude, Practice, KAP, Sustainability.

I. INTRODUCTION

Mangrove forests inhabit the highly productive inter-tidal ecosystems in over 120 countries in both tropics and subtropics, providing multiple importance to the coastal communities [1]. The forests protect the coastline from natural disasters [2] and mitigate global climate change attributable to the atmospheric carbon sequestration [3] which stockpiles the carbon within the ecosystem [1]. A large number of marine lives such as fishes and crabs reside in the ecosystem [4] where 23% of India's marine fish output in 2011 was contributed by the mangroves alone [5]. Construction materials (pile wood), charcoal, firewood, pulps, tannin, and traditional medicine products used by villagers are also sourced from the mangrove forests [6]. In Asia, the mangroves are crucial to the livelihood of more than 70% of the coastal communities which depend on the ecosystems [7] as a source of income.

Despite its importance, mangroves in these areas continue to decline as a consequence of different anthropogenic activities in each country [1]. A majority of the coastal fishers were reported to experience the most impacts of mangrove loss as they depend on the forests for source of income ([8]. Mangroves distribution were reported by [9] to occupy

18,100,000 ha worldwide, but the global coverage was revised downward to 13,776,000 ha by [10], and then decreased to 8,349,500 ha [11]. Mangrove forest loss worldwide was at least 35% in 1980s and 1990s [12], with losses of 50–80% in several regions [13]. Albeit mangroves provide critical services to the coastal community, human activities such as overfishing, illegal logging, aquaculture, soil urbanization, agriculture and pollution have led to this inevitable loss [14][15]. [16] reported the conversion of mangrove habitat into agricultural and urban land, tourist resorts, and shrimp farms, contributed significantly to the catastrophic loss of human lives and settlements during the 2004 tsunami in Aceh. Indonesia experienced net losses of mangrove cover by 28% from 5 million to 3.6 million hectares between year of 1980 to 2000 where this country is well known as world's top producers and exporters of farmed shrimp. Meanwhile in Malaysia, the annual mangrove loss in some major states in Peninsular Malaysia is about 1,282 ha or about 1% since 1990 [17]. As a result of the loss, the oasta communities living along the west coast of the Malaysian Peninsular in Penang, Langkawi Islands and Kota Kuala Muda in Kedah, Perak and Selangor are the most vulnerable to natural disaster such as tsunami which had resulted in several casualties and damaged properties during the 2004 tsunami [18].

Thus, the essence of this research is to assist the responsible parties in designing an effective mangrove rehabilitation program that caters to the current issues. The knowledge, attitude and practice factors are studied to determine their correlation and provide a better understanding on the awareness as well as the acceptance towards mangrove related issues. According to [19], Majlis Daerah Kuala Langat (MDKL) provides the opportunity for the local to give the suggestions for the preparation of Kuala Langat Local Plan 2030 (RTKL30) towards a developed, dynamic, and sustainable township. This is a great opportunity for the local community to raise the mangrove awareness for a better future planning of the mangrove conservation. The knowledge of the residents acts as an indication whether the rehabilitation program done by both the government and the non-governmental organization is effective and significant [20]. It

is also that believed that the level of awareness of residents will determine the success of environmental management by addressing and catering to the current issues while putting rehabilitation programs in action. Therefore, this study aims to determine the relationship between knowledge, attitude, practice (KAP) variable among community on the importance and sustainability of mangrove forest in Kuala Langat District, Selangor.

II. METHODS

A. Study Area

Sijangkang Mangrove Recreational Park is located in Telok Panglima Garang, Kuala Langat District, Selangor (2.9426, 101.4626). The park occupies 5.5 km area and was originally developed from an illegal dumping site. The recreational park was opened to public on August 20, 2015 and development will continue to be carried out to ensure the park remains relevant as a one-stop centre for leisure and learning. The motto 'Experience natural ecology' is the basis of the development of this recreational park and 'Edu-Recreation' is used as a module for each program carried out. This initiative can certainly evoke the spirit of love for the environment, give birth to a healthy and intelligent generation in addition to being able to draw closer to the Creator [21].

Fig. 1 Sijangkang Mangrove Recreational Park Kuala Langat Selangor map

B. Data collection

A cross sectional survey method is done aiming at investigating the Knowledge, Attitude and Practice (KAP) among the community within the Sijangkang Mangrove Recreational Park vicinity towards the issue of mangrove degradation and pollution. There were 100 respondents participated in the study, 62 respondents were non-resident of Kuala Langat and 38 respondents were residents of Kuala Langat. The sample includes government and non-

governmental organizations as well as local residents residing near the study area. Eligible respondents to the survey for local residents are those 18 years and above, and is affecting or affected by the mangrove degradation and pollution [22].

C. Data Analysis

There were 4 parts to the questionnaire. Part 1 consists of inquired general information about demographic characteristics of respondents, which includes gender, race, income, work sector, education and residency of the respondent.

Part 2 focused on the knowledge and inquired on importance, benefits and roles of mangroves for a balanced ecosystem in Malaysia. The knowledge score is determined by the 3-Likert scale where, true is given by 3 point, neutral is given by 2 point and false is given by 1 point. The total knowledge score is calculated by the summation of point of all questions for every respondent. The demographic characteristics towards the knowledge score is analyzed using ANOVA test.

Part 3 of the questionnaire consisted of inquiries of the opinions and reactions towards a few statements related to mangrove's important and sustainability. The attitude score is determined by the 5-Likert scale where, 1 point is given to strongly disagree, 2 point is given to disagree, 3 point is given to neutral, 4 point is given to agree, and 5 point is given to strongly agree. The total attitude score is calculated by the summation of point of all questions for every respondent. The demographic characteristics towards the attitude score is analyzed using ANOVA test.

Part 4 of the questionnaire was aimed at understanding the general practices that had relation to the mangroves. The practice score is determined by the 5-likert scale where, 1 point is given to never, 2 point is given to rarely, 3 point is given to sometimes, 4 point is given to frequent, and 5 point is given to very frequent. The total practice score is calculated by the summation of point of all questions for every respondent. The demographic characteristics towards the practice score is analyzed by using ANOVA test.

D. Statistical Analysis

Data obtained from the questionnaire was analyzed with The Statistical Package for Social Sciences (SPSS) version 20.0. The Analysis of Variance (ANOVA) test is used to determine the difference of demographic variable with knowledge, attitude, and practice (KAP) variables among the visitors and community in Kuala Langat. The linear correlation of regression is used to study the relationship difference among knowledge, attitude, and practices (KAP) variables among community in Kuala Langat Selangor.

A total of 67 questions was distributed, 33 questions prepared for knowledge variable, 19 questions for attitude variable and 15 questions for practice variable. The survey is conducted from February to May 2020. The sample size was 100 respondents from the local communities near the Sijangkang

Mangrove Recreational Park. The sample size was calculated using the method by [23].

$$S = (X^2 NP (1 - P)) / (d^2 (N - 1) + X^2 P (1 - P))$$

where:

S = sample size

X^2 = the table value of chi square for 1 degree of freedom at the desired confident level (3.841)

N = the population size

P = the population proportion (assumed to be 0.5 as this would provide the

maximum of sample size)

d = the degree of accuracy expressed as proportion (0.05)

III. RESULTS AND DISCUSSION

A. Social demographic aspect

The demographic of respondents is categorized under six characteristics; gender, race, income, sector, education and status of residency as shown in Table 1. The frequency of male that participated is at a rate of 51% while female is 49.0%. Malay dominated the survey by 74.0% of participants and second highest frequency of this survey is under others category with 12.0%. While Indian and Chinese were 10.0% and 4.0% respectively.

Most of the participants were from the B40<RM4849 income level, dominated with 88.0% rate. 9 participants were from the RM4850<M40<RM10959 income level with 9.0% rate. T20>RM10960 level income has 3.0% participant rate. According to [24] B40 is defined as households earning the lowest 40% of the total income of Malaysians in the range of below RM 4849. M40 is defined as households earning 41% - 80% of the total income of Malaysians between the range of RM4850 – RM10959. T20 is defined as households that earn the highest 20% of the total income of Malaysians which is over RM 10960. Income level shows the important role on managing any environmental issue as reported by [25,26] there is a strong correlation between income and environmental awareness. [26] said individuals with lower monthly income level might have less concern towards environment because of their salaries are only sufficient for the survival. People with lower income level tend to give higher important to self-security value such as basic human need rather than the universalism value for example protecting the nature. While people with higher income level can prioritize pro-environmental behaviours since the self-security value is already secured. This was supported by a statement of [27]; [28] where the good environmental awareness may be impeded due to a barrier imposed by low-income people which does not allow a person to practice some pro-environmental practices.

Among the participants, 65.0% participant rate was recorded from government workers and 21% of the

participants were from non-government organisation (NGO) and 14% were working as freelancers. There are 8 levels of education in this survey consisted of PMR, SPM, Skill certificate, STPM/Diploma, Degree, Master's Degree, Doctor of Philosophy (PhD) and Others. Most of respondents in Kuala Langat come from SPM level with 30 peoples out of 100 respondents and dominates with 30.0% rate. 28.0% participants were from Degree level, and followed by STPM/Diploma holders with 16.0% participation rate. 38.0% of the participants were residents of Kuala Langat meanwhile most of the respondents were not from the area. The level of education plays a role in environmental awareness among the people [29] where the ability to understand the large-scale and complex problems and development of collective beliefs, perspectives and attitude regarding the importance of the natural environment and its relationship with human being are prevalent in educated communities. People with higher educational level have better understanding about environmental issues and thus are more concerned towards environmental quality and more motivated to practice the environmentally responsible behaviour [30]; [31]; [32].

TABLE 1
DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS (N=100)

Characteristics		Frequency(n)	Percentage (%)
Gender	Male	51	51.0
	Female	49	49.0
Race	Malay	74	74.0
	Chinese	4	4.0
	Indian	10	10.0
	Other	12	12.0
Income	B40 <RM4849	88	88.0
	RM4850 <M40<RM10959	9	9.0
	T20 > RM10960	3	3.0
Work Sector	Government	65	65.0
	NGO	21	21.0
	Freelance	14	14.0
Education	PMR	8	8.0
	SPM	30	30.0
	Skill Certificate	8	8.0
	STPM/Diploma	16	16.0
	Degree	28	28.0
	Master's Degree	6	6.0
	PhD	3	3.0
	Other	1	1.0
Residency	Resident	38	38.0
	Non-resident	62	62.0

B. Knowledge, attitude and practice of respondent towards mangrove.

Our results revealed that the respondents have a high proportion of knowledge about the importance of mangrove forests to ensure the environmental sustainability (93.0%), mangrove forests is important to protect the coast from waves, storms and natural disasters (90.0%), mangrove swamps is important as a breeding ground for fish, crabs and shrimp (90.0%), mangrove forests can stabilize coastal areas and act as natural buffer (89.0%), and illegal dumping of garbage in mangrove swamps is against the law and can be prosecuted in court (82.0%) (Table 2). These statements corroborated by [33,34], mangroves have various functions as shoreline protection, carbon sequestration and food web support. According to [2] mangroves can buffer the impact of waves, storm surges, and tsunamis on coastal areas and stabilize the coastline from natural erosion at the same time. Mangroves also provide a shelter to various species of fish, mollusc, shrimp, and birds. Mangrove play an important role as the breeding area for various species since they are protected from high waves [33,34].

Respondents showed average proportion of knowledge regarding the statement of whether the coastal residents depend on mangrove forests for employment opportunities (68, 68.0%), mangrove forests are important for the economy and fisheries income in Kuala Langat (65, 65.0%), mangroves forests provide good resources such as charcoal, and timber for building materials such as poles (75, 75.0%), residents in coastal areas use mangrove trees to make boats and houses (61, 61.0%), there is part of mangrove trees that are used as medicine such as its buds and fruits (56, 56.0%), and the large *nipah* leaves can be used as roofs and for weaving baskets and mats (82, 82.0%). These results corroborated with [35] and [36] where the mangroves resources play an important role for the socio-economic livelihood for the local population. According to [37] and [38] mangrove resources are very diversely used especially by the local population who developed high attachment to this ecosystem. Like the worldwide coastal areas, the coastal zone of Benin, Nigeria which shelters the mangrove, suffers from the process of coastalization leading to an increased human settlement as well as of various socio-economic activities. There is a high demand for natural resources from mangrove forest at the densely coastal area and tropical zones [38–40]. Majority of our respondents agreed that illegal logging is a major factor in the extinction of mangrove forests (69.0%) and land use exchange activities (78.0%) such as aquaculture, agriculture, and hotel construction. It is undeniable that that mangrove ecosystems are facing a progressive degradation due to the abusive deforestation, the uncontrolled settlements and the occupations held at the coastal area [41]. These activities have caused the inevitable retreat of the mangrove forest cover and decrease the fishery output.

TABLE 2
RESPONDENT'S KNOWLEDGE ON MANGROVE (N=100)

	Statements	True n(%)	False n(%)	Neutral n(%)
1	The importance of mangrove forest is to protect the coast from waves, storms and natural disasters such as tsunamis.	90(90.0)*	2(2.0)	8(8.0)
2	Coastal residents depend on mangrove forests for employment opportunities.	68(68.0)*	15(15.0)	17(17.0)
3	Has the number of mangrove forests in Malaysia decreased?	76(76.0)*	10(10.0)	14(14.0)
4	The main factor in the extinction of mangrove forests is land use exchange activities. (Ex: aquaculture, agriculture, hotel construction)	78(78.0)*	8(8.0)	14(14.0)
5	Illegal dumping of garbage in mangrove swamps is against the law and can be prosecuted in court.	82(82.0)*	2(2.0)	16(16.0)
6	Mangrove forests are protected under the Malaysian Forestry Policy 1978 and the Malaysian Mangrove Forest Policy 2004.	66(66.0)*	1(1.0)	32(32.0)
7	Illegal logging is a major factor in the extinction of mangrove forests.	69(69.0)*	14(14.0)	17(17.0)
8	Among the importance of mangrove swamps is as a breeding ground for fish, crabs and shrimp.	90(90.0)*	4(4.0)	6(6.0)
9	Mangrove forests are important to ensure environmental sustainability.	93(93.0)*	2(2.0)	5(5.0)
10	Mangrove forests are important for the economy and fisheries income in Kuala Langat.	65(65.0)*	9(9.0)	26(26.0)
11	The largest mangrove forest area is located in Sabah.	68(68.0)*	7(7.0)	25(25.0)
12	Matang Mangrove Forest Reserve is the best managed mangrove forest	37(37.0)*	3(3.0)	59(59.0)

	reserve in the world.			
13	Mangrove forests provide resources such as charcoal, timber for building materials such as poles.	75(75.0)*	10(10.0)	15(15.0)
14	Mangrove areas and mud plains are important sites for birds to find food and nest.	61(61.0)*	14(14.0)	25(25.0)
15	Mangrove forests can stabilize coastal areas and act as a natural buffer.	89(89.0)*	2(2.0)	9(9.0)
16	Mangrove swamps are not resistant to high levels of disturbance and are highly sensitive to pollution.	52(52.0)	21(21.0)*	27(27.0)
17	Residents in coastal areas use mangrove trees to make boats and houses.	61(61.0)*	16(16.0)	23(23.0)
18	There are parts of mangrove trees that has been used as food by the locals.	36(36.0)*	15(15.0)	49(49.0)
19	There are parts of mangrove trees that are used as medicine such as its buds and fruits.	56(56.0)*	8(8.0)	36(36.0)
20	The large <i>nipah</i> leaves can be used as roofs and for weaving baskets and mats.	82(82.0)*	5(5.0)	13(13.0)
21	Mangrove swamps do not serve as habitats for wildlife	26(26.0)	60(60.0)*	14(14.0)
22	Mangrove forests act as water quality control and filters by trapping sediment before being taken to sea.	79(79.0)*	3(3.0)	18(18.0)
23	Mangrove forests also play an important role as a buffer to pollutant agents and act as a natural sediment trap	67(67.0)*	6(6.0)	27(27.0)
24	Mangrove forests do not serve as carbon sinks	11(11.0)	51(51.0)*	38(38.0)
25	Mangrove swamps are able to store and retain excess water during floods	54(54.0)*	16(16.0)	30(30.0)
26	Mangrove forests restrict the influx of salt water from seawater currents	54(54.0)*	18(18.0)	27(27.0)

27	Mangrove timber cannot be used as fuel.	16(16.0)	46(46.0)*	38(38.0)
28	Mangrove forests serve as a source of water for the long term	41(41.0)*	17(17.0)	40(40.0)
29	Groundwater levels can be maintained with the presence of mangrove swamps.	60(60.0)*	5(5.0)	35(35.0)
30	Biodiversity of insects in mangrove swamp forests can exceed 200 species	45(45.0)*	15(15.0)	40(40.0)
31	Mangrove trees can be used as a source of materials for medicine	53(53.0)*	14(14.0)	33(33.0)
32	Mangrove swamps are not suitable for tourism	28(28.0)	63(63.0)*	9(9.0)
33	Mangrove forests can maintain a balance of oxygen and carbon dioxide	43(43.0)*	6(6.0)	51(51.0)

Note: '**' indicates expected answers. The high response is in bold.

As shown in Table 3, positive attitude towards mangrove function and awareness among the respondents in Kuala Langat was observed based on the items with highest percentage; "I feel responsible when seeing garbage dumped around the mangrove swamp area" (70.0%), "I take care of the cleanliness when visiting recreational forests and coastal areas" (67.0%), and "I agree that the function of mangrove forests is important and that mangrove conservation measures should be taken seriously" (67.05%). The lowest correct answers were "Prohibition of dumping garbage around mangrove swamps and coastal areas is effective" (6.0%), and the second lowest is "Facilities provided for garbage disposal in mangrove swamps and coastal areas are adequate" (8.0%). Our results also revealed that the community in Kuala Langat shows little knowledge regarding the dumping issues where they believed the mangrove area have sufficient garbage disposal and the prohibition of dumping garbage around the mangrove is effective while mangrove coastal area still being treated like a dumping site. The awareness towards this issue was lacking among the communities. As reported by [42], the awareness on the importance of mangroves is still less among Malaysians as they treat the ecosystem as insignificant. The worrying state of the last mangrove located at Batu Maung, Georgetown, Pulau Pinang where it is currently under serious threat to become a dumping area as the lands are filled with industrial and construction waste which shows the lack of awareness among the community. About 15 percent from the 20 ha mangrove forests there is totally barren and buried under mounds of rubbish, rubble and construction waste.

Our respondents, on the other hands possessed positive attitude about the mangrove as they strongly agreed that they feel responsible when they see the garbage dumped around the mangrove swamp area (70, 70.0%). The respondents also

agreed that the visitors should take care of cleanliness when visiting the recreational forests and coastal area (67.0%). They agreed that the measures regarding the mangrove conservation should be taken seriously (67.0%).

Respondents showed positive attitude on the awareness in handling garbage as everyone's sole responsibility. People need to have a sense of responsibility to dump their garbage to a proper place rather than improperly disposing it elsewhere. According to [43], littering at a public place is considered as a problem that brings negative perception for both environmental and socioeconomic impacts. The litter composition and its quantity will determine the magnitude of the problem arising from the improper handling of the trash. Littering degrades the aesthetics of the public places and may invoke serious public health. Therefore, the conservation of the mangroves is of paramount important for the global wellbeing otherwise services that are offered by this ecosystem to the mankind will be diminished ([44]. Hence, there is a need to demonstrate a good attitude when visiting mangrove recreational parks in order to preserve and protect the ecosystems for future generations.

As shown in Table 4, the items with highest percentage of positive practices towards mangrove function and awareness were "I make sure solid waste from my activities is not dumped in the wrong areas" (55.0%), "I follow the law when visiting or vacationing in coastal areas and mangrove swamps" (50.0%), and "I never dumped rubbish in coastal areas and mangrove swamps" (47.0%). The lowest percentage of positive practice was "I used to buy handicrafts made from mangrove trees" (17.0%) where the majority (33.0%) has never purchased handicrafts sourced from the mangrove tress. It is important to participate or be the volunteer in any

conservation mangrove related programs to appreciate, to learn and to educate the public about the importance of mangrove's function and existence.

However, we discovered that at least 22 participants admitted they have never practiced the statement "I have incurred costs to assist with mangrove conservation activities", meanwhile 17 participants claimed to have done as stated. Few respondents in Kuala Langat appeared to have a negative practice towards mangrove sustainability where 32 participants claimed they have never participated in any mangrove conservation activities organized in the area. According to [45,46], when people found the importance of mangrove ecosystem, the awareness among the authorities will be increased to tighten the regulations of coastal and land use development. It was supported by [47] that community appreciation and understanding of coastal and mangrove ecosystem is key to their conservation.

Other similar case that shows worrying practice is where 39% of our respondents claimed they sometimes incur the costs to ensure the waste from their activities is handled well, while the supposed positive practice is, they should frequently invest in the cause as they must be responsible for every waste they made. People need to spend their money to handle the waste that they produced to help improve the environmental conditions in their areas. [48] reported that 112 respondents from Kuala Langsa, Aceh were willing to pay for the mangrove conservation in their area. The average sum of money that respondents in this area willing to pay for mangrove preservation and reparation of degrading mangrove was about RM9.40 per month. Willingness to pay is the price value an individual willing to pay for improving the quality of the environment.

TABLE 3
RESPONDENT'S ATTITUDE ON MANGROVE (N=100)

	Statements	Strongly disagree n(%)	Disagree n(%)	Neutral n(%)	Agree n(%)	Strongly Agree n(%)
1	I feel responsible when seeing garbage dumped around the mangrove swamp area.	6(6.0)	3(3.0)	6(6.0)	15(15.0)	70(70.0)*
2	Prohibition of dumping garbage around mangrove swamps and coastal areas is effective.	6(6.0)*	14(14.0)	15(15.0)	24(24.0)	41(41.0)
3	Facilities provided for garbage disposal in mangrove swamps and coastal areas are adequate.	8(8.0)*	17(17.0)	25(25.0)	25(25.0)	25(25.0)
4	I agree that the responsible party should be charged compensation to cover the cost of full cleaning. (Polluters pay principle)	4(4.0)	1(1.0)	12(12.0)	27(27.0)	56(56.0)*
5	I take care of the cleanliness when visiting recreational forests and coastal areas.	1(1.0)	-	6.0(6.0)	25(25.0)	67(67.0)*
6	I agree that the function of mangrove forests is important and that mangrove conservation measures should be taken seriously.	1(1.0)	2(2.0)	8(8.0)	22(22.0)	67(67.0)*
7	I support the construction of new hotels and resorts around the coast.	21(21.0)*	30(30.0)	21(21.0)	17(17.0)	11(11.0)

8	I support the conversion of land use because it can bring more profit than maintaining mangrove swamp forest.	29(29.0)*	14(14.0)	25(25.0)	14(14.0)	18(18.0)
9	I am interested to know more about the importance of mangrove swamps.	2(2.0)	-	11(11.0)	37(37.0)	50(50.0)*
10	I am interested in participating in mangrove swamp conservation activities.	1(1.0)	-	17(17.0)	33(33.0)	49(49.0)*
11	I feel that the laws relating to mangrove forests are less stringent.	7(7.0)	-	16(16.0)	43(43.0)	34(34.0)*
12	Enforcement related to mangrove swamp forest laws should be given attention by the authorities.	1(1.0)	-	11(11.0)	31(31.0)	57(57.0)*
13	Heavier fines should be imposed on visitors found dumping rubbish in mangrove swamp forests and coastal areas.	2(2.0)	1(1.0)	5(5.0)	34(34.0)	56(56.0)*
14	I am interested in buying handicrafts made from mangrove trees.	6(6.0)	10(10.0)	25(25.0)	26(26.0)	33(33.0)*
15	I am interested in incurring costs for mangrove forest conservation activities.	3(3.0)	11(11.0)	32(32.0)	36(36.0)	18(18.0)*
16	I am interested in getting involved in mangrove planting activities.	3(3.0)	5(5.0)	18(18.0)	25(25.0)	49(49.0)*
17	I think that the lack of mangrove forests has a significant impact on the surrounding population.	1(1.0)	3(3.0)	10(10.0)	36(36.0)	49(49.0)*
18	I think that population growth is also one of the main factors in the decreasing numbers of mangrove swamps.	2(2.0)	3(3.0)	15(15.0)	42(42.0)	38(38.0)*
19	I think that waste segregation can reduce the amount of garbage in mangrove swamps.	-	-	14(14.0)	45(45.0)	40(40.0)*

Note: '*' indicates expected answers. The high response is in bold.

TABLE 4
RESPONDENT'S PRACTICE OF MANGROVE (N=100)

	Statements	Never n(%)	Rarely n(%)	Sometimes n(%)	Frequent n(%)	Very Frequent n(%)
1	I made sure that the polluted water from my activities did not flow into the river.	9(9.0)	4(4.0)	21(21.0)	25(25.0)	40(40.0)*
2	I make sure solid waste from my activities is not dumped in the wrong areas.	3(3.0)	2(2.0)	10(10.0)	30(30.0)	55(55.0)*
3	I once participated in mangrove conservation activities organized around my area.	32(32.0)	10(10.0)	10(10.0)	14(14.0)	33(33.0)*
4	I am fully responsible for cleaning the surrounding areas involved in pollution by my activities.	4(4.0)	3(3.0)	18(18.0)	31(31.0)	44(44.0)*
5	I incur costs to ensure the waste from my activities is handled well.	6(6.0)	6(6.0)	39(39.0)	15(15.0)	34(34.0)*
6	I follow enforcement recommendations to ensure environmental sustainability in my area.	4(4.0)	3(3.0)	23(23.0)	28(28.0)	42(42.0)*
7	I refer to existing policies before planning activities that have an impact on the environment	4(4.0)	2(2.0)	20(20.0)	40(40.0)	34(34.0)*
8	I always take into account the environmental aspects in planning the activities or programs made.	1(1.0)	-	19(19.0)	40(40.0)	40(40.0)*
9	I never dumped rubbish in coastal areas and mangrove swamps.	11(11.0)	4(4.0)	13(13.0)	24(24.0)	47(47.0)*
10	I used to buy handicrafts made	33(33.0)	12(12.0)	17(17.0)*	14(14.0)	24(24.0)

	from mangrove trees.					
11	I follow the law when visiting or vacationing in coastal areas and mangrove swamps.	4(4.0)	5(5.0)	14(14.0)	27(27.0)	50(50.0)*
12	I have incurred costs to assist with mangrove conservation activities.	22(22.0)	16(16.0)	24(24.0)	20(20.0)	17(17.0)*
13	I have switched to more environmentally friendly items in my activity.	4(4.0)	12(12.0)	18(18.0)	36(36.0)	30(30.0)*
14	I segregate garbage to facilitate the recycling process in my area.	9(9.0)	5(5.0)	23(23.0)	26(26.0)	36(36.0)*
15	I follow community programs to clean up areas around beaches and / or mangrove swamps.	13(13.0)	7(7.0)	14(14.0)	30(30.0)	35(35.0)*

Note: '**' indicates expected answers. The high response is in bold.

Our results revealed that respondents possessed good practices about handling the solid waste such as making sure the solid waste from their activities is not dumped in the wrong area (55.0%), they also never dumped the rubbish in coastal or mangrove swamps (47.0%) and they always fully responsible for cleaning the surrounding areas that results in pollution by their activities (44.0%). These good practices corroborated by [49] that mangrove forest has become a dumping ground of waste due to lack of recycling habit in the individual. Dumping waste at open fields and river becomes a common waste disposal behaviour among people in Kuala Lumpur [50]. According to [51] the mangrove is at risk and a pollution threatening the mangrove ecosystem as mangroves are often used for dumping waste especially the non-degradable plastics that constantly harm both the ecosystem and species living in it. The good practices will be the key to maintain the future sustainability of mangrove if the they are exercised by the community in Kuala Langat.

C. Total knowledge scores between demographic characteristics.

The total knowledge scores between demographic characteristics are calculated by using the ANOVA test. As shown in Table 5, there was no significant difference between male and female respondent at $p = 0.079$. The total knowledge score of races between Malay, Chinese, Indian and others also shows no significant difference at $p = 0.405$. There was no significant difference between income level of B40, M40 and T20 at $p = 0.230$. The total knowledge score of work sector among government, non-government organisation and freelance also shows no significant difference at $p = 0.802$. The residency characteristics showed no significant difference at $p = 0.913$ among Kuala Langat resident and Non-Kuala Langat residents. Whereas, education level among the respondent shows significant difference at $p = 0.009$ with skill certificate shows higher mean knowledge score than PMR, SPM, STPM/Diploma, Degree, Master's Degree, PhD, and others.

TABLE 5
COMPARISON OF TOTAL KNOWLEDGE SCORES BETWEEN
DEMOGRAPHIC CHARACTERISTICS USING ANOVA TEST (N=100).

	n	Mean	F-Statistics	P-Value
<u>Gender</u>				
Male	51	77.29	3.148	0.079
Female	49	74.31		
<u>Race</u>				
Malay	74	75.20	0.981	0.405
Chinese	4	73.00		
Indian	10	78.30		
Others	12	78.58		
<u>Income</u>				
B40<RM4849	88	75.49	1.492	0.230
RM4850<M40<RM10959	9	80.22		
T20>RM10960	3	72.67		
<u>Work Sector</u>				
Government	65	75.46	0.221	0.802
NGO	21	76.14		
Freelance	14	77.07		
<u>Education</u>				
PMR	8	78.00	2.868	0.009
SPM	30	72.77		
Skill Certificate	8	81.13		
STPM/Diploma	16	79.94		
Degree	28	74.86		
Master's Degree	6	80.17		
Phd	3	65.33		
Others	1	75.00		
<u>Residency</u>				
Kuala Langat's				

resident	38	75.71	0.012	0.913
Non-Kuala Langat's resident	62	75.90		

The total knowledge scores of males towards the mangrove awareness study shows that it has slightly higher mean knowledge than female at 77.29. This is in line with the claim that male tends to have higher general knowledge than female [52]. Male also shows greater knowledge of general science and biology compared to female [53]. The education level from respondents in Kuala Langat showed significant difference at $p = 0.009$ with skill certificate holders have the highest knowledge mean. Most of respondents in different educational level have a good knowledge regarding the awareness of mangrove. [54] reveals that education level plays a vital role in the public perception participation regarding the mangrove forest and people with higher education proven to have more awareness regarding the importance to balance and sustain the mangrove ecosystem. Nevertheless, [55] found that high education level does not always give correlation with the knowledge, attitude and practices regarding the awareness on mangrove forest sustainability. Local knowledge is very important to strengthening the ability of the community to use their knowledge in managing the mangrove resources [56]. Good knowledge can be used by the locals to be applied to environmental management such as eco-tourism places with better handling and understanding.

D. Total attitude scores between demographic characteristics.

The total attitude scores among demographic characteristics were calculated by using the ANOVA test. As shown in Table 6, there is no significance difference between male and female at $p = 0.515$. Race differences among the respondents showed no significant difference of attitudes score among Malay, Chinese, Indian, and others at $p = 0.135$. The income level shows no significant difference between B40, M40 and T20 at $p = 0.950$. Work sector showed no significant difference among government, non-government organisation and freelance at $p = 0.109$. Education among respondent shows no significant difference between PMR, SPM, Skill Certificate, STPM/Diploma, Degree, Master's Degree, PhD and Others at $p = 0.417$. Residency of respondent showed significant difference at $p = 0.001$ while Non-Kuala Langat residents showed higher mean attitude score at 82.94.

The study found that there was a significant difference among Kuala Langat resident and non-Kuala Langat resident at $p = 0.001$ towards attitude variable. The result revealed mean attitude score of non-residents higher than resident of Kuala Langat with 82.94 over 77.66. This can be possible that non-residents have an attachment to the mangrove more as they have work purpose at Kuala Langat where they may have better practices regarding the mangrove awareness. It is supported by findings of [57] that communities that highly

depend on the mangrove resources have better positive perception towards protecting the mangrove swamp forest.

TABLE 6

COMPARISON OF TOTAL ATTITUDES SCORE BETWEEN DEMOGRAPHIC CHARACTERISTICS USING ANOVA TEST (N=100).

	n	Mean	F-Statistic	P-Value
<u>Gender</u>				
Male	51	80.43	0.427	0.515
Female	49	81.45		
<u>Race</u>				
Malay	74	79.93	1.897	0.135
Chinese	4	85.00		
Indian	10	82.00		
Others	12	84.83		
<u>Income</u>				
B40<RM4849	88	80.93	0.051	0.950
RM4850<M40<RM10959	9	81.33		
T20>RM10960	3	79.67		
<u>Work Sector</u>				
Government	65	81.77	2.269	0.109
NGO	21	77.76		
Freelance	14	81.79		
<u>Education</u>				
PMR	8	78.75	1.028	0.417
SPM	30	78.47		
Skill Certificate	8	85.00		
STPM/Diploma	16	82.56		
Degree	28	81.96		
Master's Degree	6	80.67		
PhD	3	82.00		
Others	1	83.00		
<u>Residency</u>				
Kuala Langat's resident	38	77.66	12.101	0.001
Non-Kuala Langat's resident	62	82.94		

E. Total practice scores between demographic characteristics.

The total practices scores among demographic characteristics were calculated using ANOVA test. As tabulated in Table 7, there was no significance difference of practice score between male and female at $p = 0.065$. Race showed no significant difference of practice score among Malay, Chinese, Indian,

and others at $p = 0.836$. The income level shows no significant difference between B40, M40 and T20 at $p = 0.355$. Work sector shows no significant difference of practice score among government, non-government organisation and freelance at $p = 0.813$. Education among respondent showed no significant difference of practice score between PMR, SPM, Skill Certificate, STPM/Diploma, Degree, Master's Degree, PhD and others at $p = 0.119$. Residency of respondent showed no significant difference at $p = 0.970$ among Non-Kuala Langat and Kuala Langat residents.

TABLE 7

COMPARISON OF TOTAL PRACTICES SCORE BETWEEN DEMOGRAPHIC CHARACTERISTICS USING ANOVA TEST (N=100).

	n	Mean	F-Statistic	P-Value
<u>Gender</u>				
Male	51	58.02	3.494	0.065
Female	49	53.80		
<u>Race</u>				
Malay	74	55.36	0.285	0.836
Chinese	4	56.00		
Indian	10	58.40		
Others	12	55.95		
<u>Income</u>				
B40<RM4849	88	55.69	1.046	0.355
RM4850<M40<RM10959	9	60.33		
T20>RM10960	3	50.33		
<u>Work Sector</u>				
Government	65	55.62	0.208	0.813
NGO	21	55.76		
Freelance	14	57.79		
<u>Education</u>				
PMR	8	58.38	1.698	0.119
SPM	30	52.57		
Skill Certificate	8	64.38		
STPM/Diploma	16	57.00		
Degree	28	54.43		
Master's Degree	6	63.67		
PhD	3	57.00		
Others	1	47.00		
<u>Residency</u>				
Kuala Langat's resident	38	55.89	0.001	0.970
Non-Kuala Langat's resident	62	55.98		

F. Total KAP Score

There were 33 questions prepared for 100 respondents to study their knowledge level on mangrove, 19 questions for the attitude variable and 15 questions for the practice variable. The calculation was based on the total score of each variable using Likert scale, where for knowledge score, 3 score for true answer, 2 scores for neutral answer and 1 scores for false answer. While in attitude score, it was calculated from 5-Likert scale where, 5 score for strongly agree, 4 scores for agrees, 3 scores for neutral, 2 scores for disagree, and 1 score for strongly disagree. Otherwise, in practice score it was calculated from 5-Likert scale, 5 scores for very frequent, 4 scores for frequent, 3 scores for sometimes, 2 scores for rarely and 1 scores for never [58].

As shown in Table 8, the KAP score was calculated using SPSS version 20. The total knowledge score was high at 80.93 ± 7.77 with the minimum score of 52, the maximum score of 97, and the median was 81.00. Meanwhile, the attitude score was high at 75.83 ± 8.51 with the minimum score was 39, the maximum score is 95, and the median is 76.00. A study from [59] also shows high attitude mean score at 82.40 among the communities living in the city of Jakarta, Bogor, Depok, Tangerang, and Bekasi. The survey study was to describe the profile of community attitudes in conserving coral reefs and mangroves in environmental education aspect. They concluded the attitude of the community was already in the very high state, but further efforts need to be made to improve that attitude through environmental education [59]. Otherwise, the community in Kuala Langat showed average practice scores of 55.95 ± 11.44 with minimum practice score was 15, maximum practice score was 75, and the median was 56.00.

TABLE 8

TOTAL KAP SCORE

Variable Score	Knowledge	Attitude	Practice
Mean $\pm$ SD	80.93 $\pm$ 7.77	75.83 $\pm$ 8.51	55.95 $\pm$ 11.44
Median	81.00	76.00	56.00
Minimum	52	39	15
Maximum	97	95	75

Note: SD (Standard Deviation)

G. KAP scores level

Table 9 shows the KAP scores level among the 100 respondents, where low KAP level has the percentage between 0 – 33% score, average KAP level has between 33 – 66% score and good KAP level is in the range of 66 – 100% score. In knowledge score, 38 participants show low knowledge scores, 33 participants showed average knowledge scores and 29 participants show good knowledge score. Otherwise, 36 participants showed low level of attitude score, 37 participants showed average level of attitude score and 27

participants showed good attitude level score. While, 34 participants showed low level of practice score, 33 participants showed average level of practice score and 33 participants showed good level of practice scores.

TABLE 9
KAP SCORE LEVEL AMONG RESPONDENT.

Score level	Low (0 – 33%)	Average (33 – 66%)	Good (66 – 100%)
Knowledge	38	33	29
Attitude	36	37	27
Practice	34	33	33

H. KAP correlation

TABLE 10
CORRELATION BETWEEN TOTAL KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) SCORES.

Variables	Regression (r)	P-value	Strength of correlation
Knowledge, Attitude	0.270	0.007	Weak
Attitude, Practice	0.498	0.001	Moderate
Knowledge, Practice	0.239	0.017	Weak

The correlation between total knowledge, attitude and practice scores were calculated by using linear regression statistically significant at ($p < 0.05$). As shown in Table 10, there is positive weak significant correlation between knowledge and attitude scores at $p = 0.007$. The attitude showed moderate significant positive correlation with practice scores at $p < 0.001$, while there is weak positive significant correlation observed between knowledge and practice scores at $p = 0.017$. The strength of correlation is stated by Cohen (2013) where weak correlation is in the range of ($r = 0.10 - 0.29$), moderate correlation is at ($r = 0.30 - 0.49$) and strong correlation is at ($r = 0.50 - 1.00$).

The relationship between attitude and practices showed the highest correlation at $r = 0.498$ among others KAP variable where the increase change in the attitude of respondent will increase the change in their practices towards maintaining the sustainability of the mangrove in Kuala Langat area. The linear regression graph of each relationship variable is shown in Fig. 2, 3 and 4 respectively.

Fig. 2 Correlation between Total Scores of Knowledge and Total Score of Attitude

There was a weak positive significant correlation between total knowledge and total attitude scores ($r = +0.270$, $p = 0.007$) as shown as Figure 2. The regression analysis shows that 1-unit increment of knowledge of will result in about 7 % (percentage of r^2) more attitudes. Based on this result there is association found between the knowledge and attitudes of the respondent in Kuala Langat towards the mangrove function and conservation.

There was a moderate positive significant correlation between total attitude and total practice scores with $r = +0.498$ ($p < 0.001$) as shown in Figure 3. The regression analysis shows that 1-unit increment of attitude will result in about 25% (percentage of r^2) more practices. Based on this result there is an association found between attitude and practices of the respondent in Kuala Langat towards the mangrove function and conservation.

Fig. 3 Correlation between Total Scores of Attitude and Total Scores Practice

There was weak positive significant correlation between total knowledge and total practices scores ($r = +0.239$, $p = 0.017$) as shown in Figure 4. Regression analysis shows that 1-unit increment of knowledge will result about 6% (percentage of

r^2) more practices of the respondents in Kuala Langat towards the mangrove function and conservation.

Fig. 4 Correlation between Total Scores of Knowledge and Total Scores of Practice.

The relationship of knowledge, attitude and practices among respondent in Kuala Langat towards awareness of mangrove showed weak positive correlation between knowledge to attitude ($p = 0.007$), moderate positive correlation between attitude to practice ($p < 0.001$), and weak positive correlation between knowledge to practice ($p = 0.017$) where each variable has an effect towards each other. The knowledge of respondents has an effect on their attitudes towards mangrove awareness and the attitudes can affect their practices to take care of mangrove area. This is supported by [60] that a group of people with a high sense of environmental responsibility will show a good attitude towards the environment and recognize the importance of nature and the environment.

The relationship of KAP determined by the knowledge was used as independent variable to where it was assumed to have the direct effect on dependent variable which was the attitude. Attitude is a dependent variable that being tested and measured. The possible effect on the attitude might cause by the changing of the respondent knowledge about mangrove [61]. Practice is a dependent variable where respondent demonstrate their knowledge and attitude through their action in managing mangrove for a better way. It was supported by [62] where knowledge is the foundation of behaviour change, and attitudes are the driving force of behaviour change.

The study also found that there was a significant difference among the KAP relationship showing there was effect between KAP variables. The knowledge has the effect on attitude, the attitude has the effect on practice, and the knowledge has the effect on practice. Knowledge can predict the attitude and practices of the community towards the important and sustainability of mangrove swamp forest. According to [63] the association between two variables will be stronger if there is the potential causal link between them

and the knowledge and attitude [33] influences the preventive practice.

IV. CONCLUSION

This study reveals high knowledge score, high attitude score and average practice score among community in Kuala Langat towards mangrove conservation. The study concludes the association exists among KAP variables. Knowledge variable could change into positive attitude of participant where could mediate their practices on mangrove swamp forest. Knowledge could help achieve successful attitudinal and behavioural change significantly among participant. Even with the positive knowledge, attitude and practices that have in the respondent about the mangrove forest, the raising awareness and education about the mangrove is very important for the community to protect and conserve the mangrove sustainability in the future. Providing the training in reforestation techniques and raising the awareness on the importance of mangrove would greatly benefits both mangrove and local communities. Local communities should be given the basic training and the confidence to initiate the mangrove regeneration, replanting mangroves could be very successful given that the local communities already have a relatively good level of awareness about the function and conservation of mangrove forests.

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